CONCRETE CONSTRUCTION P O BOX 444 ELMHURST ILLINOIS TERRACE 4 5110

MAR 1960

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home office
P. O. Box 444—Elmhurst, Ill.
TErrace 4-5110

east coast
WALTER J. MASTERSON JR.
P. O. Box 206—Essex, Conn.
South 7-1838

west coast
DUNCAN A. SCOTT & CO.
1901 West 8th St.—Los Angeles
Dunkirk 8-4151

85 Post Street—San Francisco
Garfield 1-7950

Published monthly and copyrighted © 1960 by Concrete Construction Publications, Inc. Accepted as controlled circulation publication at Chicago, Illinois.

Individual subscriptions at the rate of $5.00 per year, $9.00 for 2 years (U.S.A.); $10.00 per year (foreign). Single copies $1.00. Bound volumes of previous years' issues, when available, at $10.00 (U.S.A.), $15.00 (foreign). Subscription and bound volume orders must be accompanied by check or money order.

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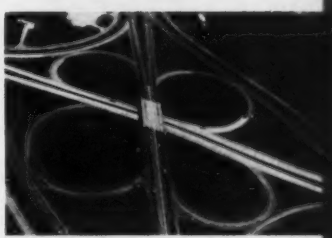
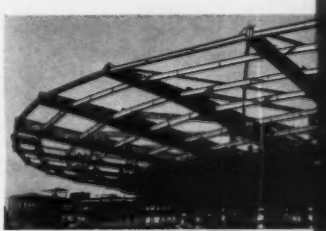


Color in Concrete. With more and more designers calling for color to combat drabness and monotony, concrete has a new opportunity to display its versatility. This article surveys the various methods available.

Cements on Parade. If you're under the impression that cement is cement and that's that, you'll want to read this discussion of the various types and the purposes for which they are used.

Experience With Epoxy Resins. A highway maintenance engineer on the New Jersey Turnpike presents some very practical information concerning the use of these versatile materials for repair and maintenance purposes.



Jet-Age Roof. How weight reduction and other knotty problems were solved in roofing over several acres of an airport terminal.

Over 33,000 copies mailed. Edited for all who are concerned with quality, job placed concrete (including prestress, tilt-up, lift slab, and thin-shell)—its specification, production, handling, forming, reinforcing, placing, finishing, and curing: *Concrete Contractors, General Contractors, Engineers, Architects, Industrial Construction and Maintenance Men, Highway Engineers, Ready-Mixed and Prestressed Concrete Producers.*

About our page numbers: The pages of Concrete Construction Magazine are numbered continuously from January through December each year as a means of facilitating the use of bound volumes for reference purposes.

WHAT IS CONCRETE?

A glimpse into a few of the complex characteristics of an important composite

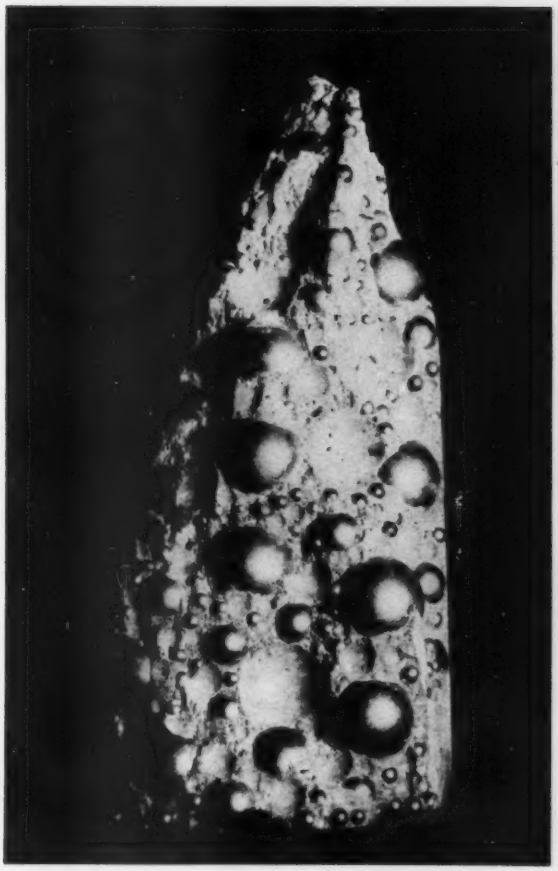
This Is Concrete?

Concrete is a heterogeneous system of solid, discrete, gradiently sized, inorganic mineral aggregates, usually plutonic (feldspathosilicaceous or ferromagnesian) or sedimentary-calcareous in origins, embedded in a matrix compounded of synthesized polybasic alkaline and alkaloidal silicates held in aqueous solution and co-precipitate dispersion with other amphoteric oxides, this matrix being originally capable of progressive dissolution, hydration, reprecipitation, gelation and solidification through a continuous and coexistent series of crystalline, amorphous, colloidal and cryptocrystalline states and ultimately subject to thermoallotriomorphic alteration, the system when first conjoined being transiently plastic during which stage it is impressed to a predetermined form into which it finally consolidates, thus providing a structure relatively impermeable and with useful capacity to transmit tensile, compressive and shear stresses.

CONCRETE IS THE ONLY MAJOR BUILDING MATERIAL which is delivered to the job site in a plastic state. This unique characteristic makes possible several of the advantages that concrete enjoys over competitive materials; moldability to practically any form or shape; easy provision for continuity of structural action; wide latitude in surface textures and colors; and adaptability to many uses ranging from foundations to pent houses, from super highways to private homes.

Hand in hand with these advantages comes an increased responsibility for the contractor. He is no purchasing agent who assembles components into a finished structure. He has become a molder of the building, pavement, bridge or other project at hand. As such, his actions have profoundly important effects upon the finished product.

Naturally, an intimate knowledge of the material is necessary if contractors are to handle it in a manner designed to ensure the desired results. Because concrete is a complex material, whose quality depends considerably upon its "ingredients" and the way it is placed and cured, there are a great many variables involved. Studies and reports on these variables by university, governmental and association groups abound in the technical literature. All well and good. Research must



A significant feature of the structure of concrete is shown by this crushed specimen, in which conventional aggregate is replaced by spherical steel balls. Note that in the hollows left by the steel balls which were torn away, we see cement paste rather than other steel balls. Although not apparent to the eye, sand particles are separated from other sand particles in exactly the same way.

precede all education. But, strangely enough, there are few books or articles available that explain in non-scientific terms the basic characteristics of our versatile material. As can be readily appreciated from a glance at the boxed definition, complex, technical language can sometimes totally obscure meaning. This discussion is undertaken in the hope of casting a little light[1] into some of the murky corners of what is admittedly an extremely complex subject.

gross structure

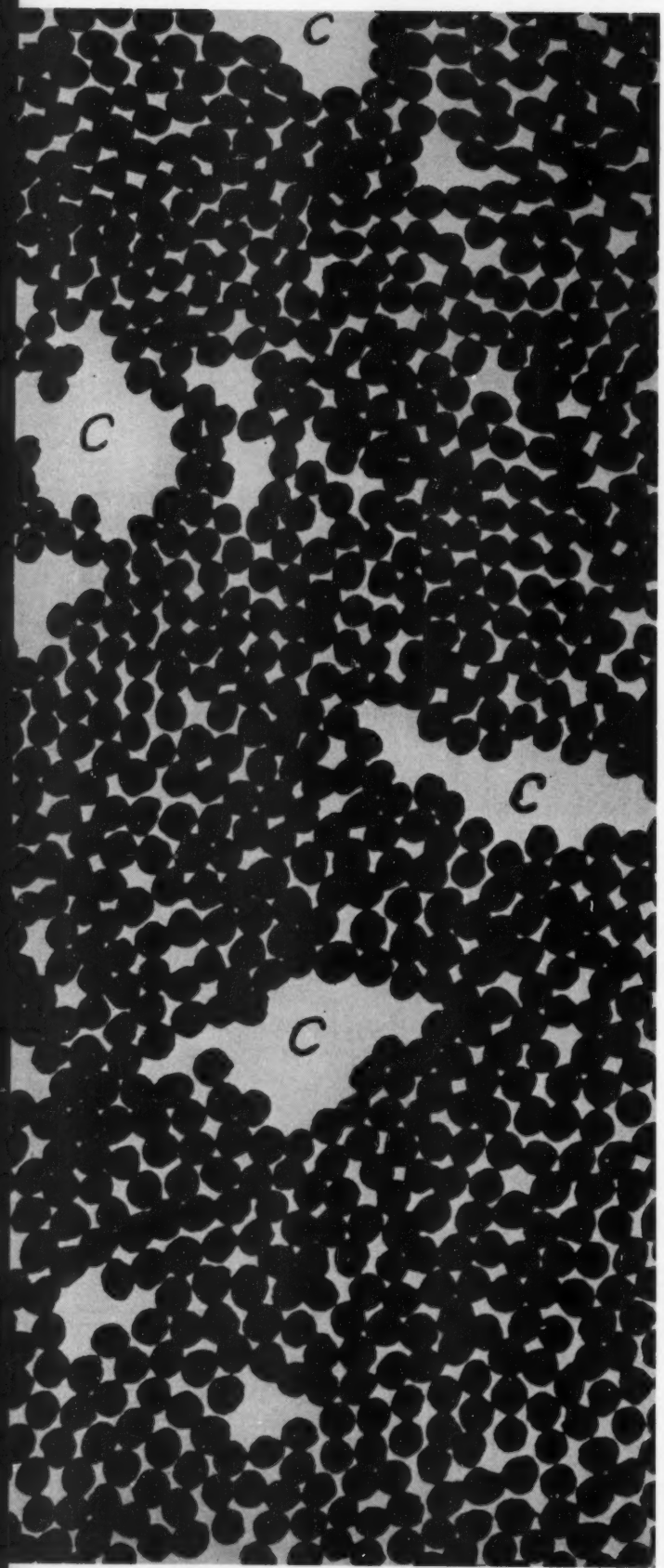
Concrete is a composite; that is, it is composed of several materials held together in one mass. In the case of concrete, it is aggregates which are bound into a mass by cement paste. Concrete has been termed a pseudosolid because, although resembling one, it does not behave as a true solid.

Because aggregates are quarried from natural deposits and receive little treatment beyond crushing and washing (excepting manufactured varieties), there are bound to be impurities present in all concretes. Of course, impurities are introduced via the other ingredients as well—the water and even, on occasion, the cement. These foreign elements, especially if organic, may tend to undermine the strength and durability of the concrete. They react with or retard the hydration process and destroy the bond of the cement paste with the aggregate particles. But one of the important facts concerning concrete is its astonishing tolerance for all but a very few natural elements. And of course a fair number of foreign elements, such as air entraining agents, are deliberately added to concrete to enhance one or more of its basically excellent structural charateristics.

Every aggregate particle in concrete—from the finest sand grain to the largest gravel size—is completely coated with cement paste (assuming a plastic mix). No aggregate particle touches any of its neighbors. Therefore, concrete becomes, in theory, a complete unbroken network of cement paste with aggregate interspersed throughout.

The aggregate is used to reduce the amount of cement paste required because cement is the most expensive ingredient of concrete. Economy dictates that in most work the aggregate should compose the greatest possible volume of the mix. (A typical concrete mix consists of 75 percent aggregates and 25 percent cement paste). Proper aggregate grada-

[1]For the sake of clarity and pertinence, all exclusively laboratory induced qualities and states of concrete are ignored. For example, it is possible under laboratory conditions to produce an absolutely dry concrete; under field conditions it just doesn't happen.



In this simplified model of paste structure, solid dots represent gel particles. Interstitial spaces are gel pores and the larger spaces, identified by the letter C, are capillary cavities.

tion assures this maximum aggregate content in concrete together with such valuable attributes as good workability and easy compaction.

A simple experiment can demonstrate why this is true. Fill a bowl with No. 50 sand (or any fine aggregate of uniform particle size). Pour water into the bowl until it reaches the top; then pour it out and measure the quantity that was needed to fill the receptacle. Afterwards, repeat the procedure using 1½-inch gravel (or any coarse aggregate of uniform particle size). You will discover that exactly the same amount of water is needed in both cases. Appearance-wise it would seem that the large spaces would require much more water than the minute voids between the fine sand grains.

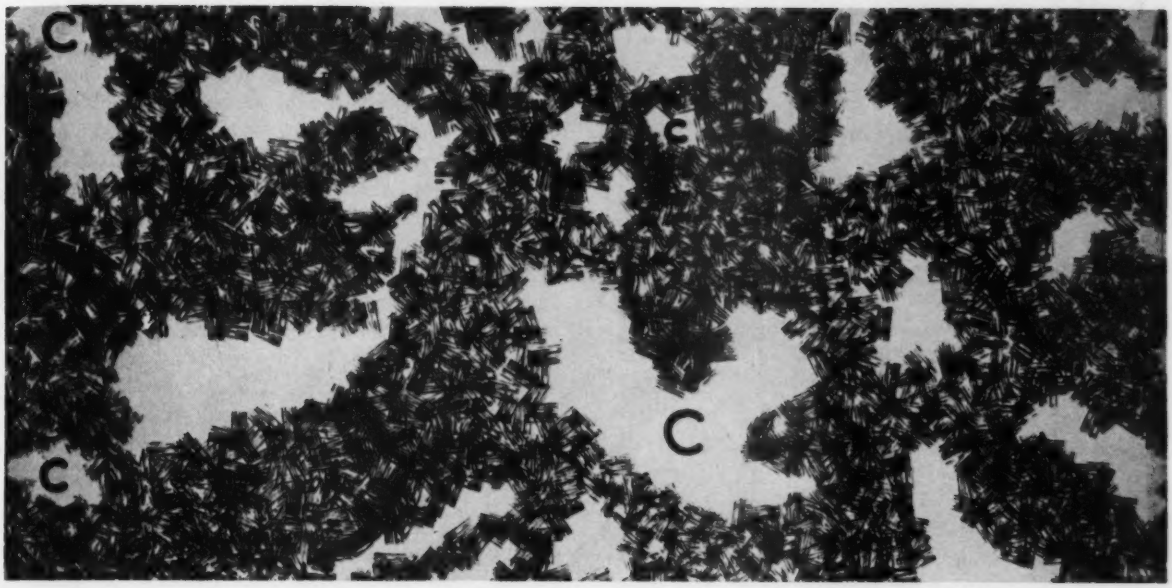
Now combine the coarse and fine aggregate and repeat the procedure. It will be noted that the amount of water needed to fill the bowl will be noticeably reduced. If other aggregate sizes were added, the quantity of water required to fill the voids would progressively diminish.

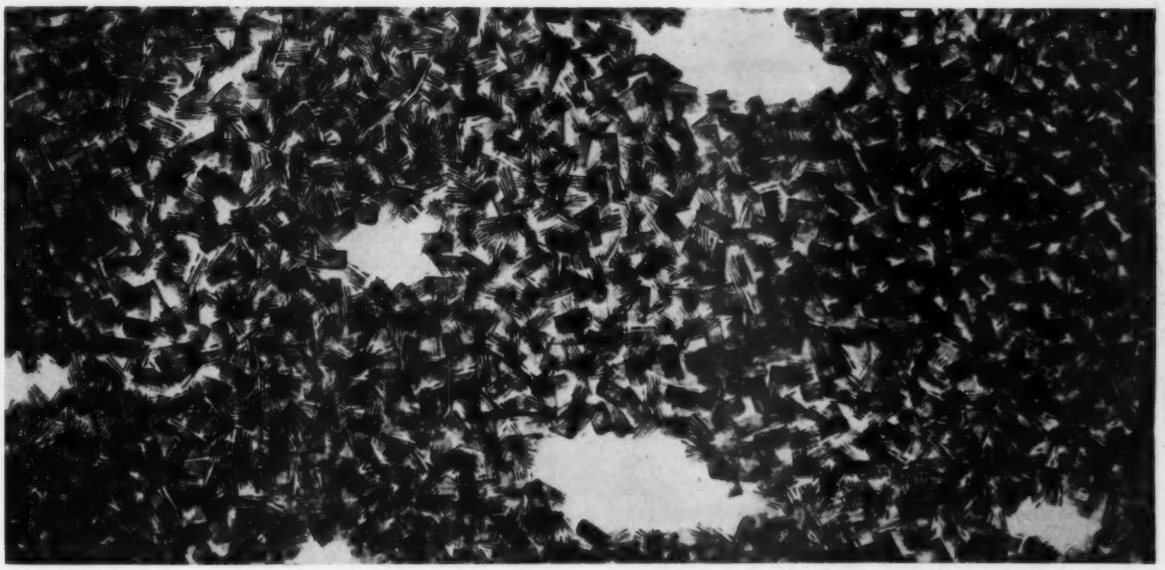
In concrete it is cement paste, not water alone, which fills the space between the aggregates. It can easily be seen that the lowest cost mix will be the one with the best graded aggregates; that is, with the most complete range of sizes from extreme fines to the maximum coarse aggregate size designated, with no one size predominating. Naturally, other factors affect the practicality of a mix (for example, aggregate shape and mineral composition greatly influence workability, durability and economy) but gradation ranks high on the list in this matter.

By using the largest maximum coarse aggregate size (consistent with available materials) permitted by form dimensions and reinforcement concentration, it will be possible to incorporate the greatest variety of aggregate sizes in the concrete and the greatest economy will result. When a well graded natural aggregate supply is not available, ready mix plants stock several sizes of aggregates which can be blended scientifically with modern batching equipment to produce a mix that will be both economical and workable.

paste structure

We have noted that concrete is composed of aggregates of widely varying chemical and physical composition and cement paste. Like the chain that is no stronger than its weakest link, concrete





It is likely that gel particles are fibrous or platy, as shown in these two model studies, rather than spherical. In the top illustration the drawing is constructed to correspond to a capillary porosity of 20 percent, which is that of a well-cured paste having a water/cement ratio of 0.5 by weight. The illustration below shows the effect on capillary porosity of reducing the water/cement ratio from 0.5 to 0.3. In this model the capillary porosity is 7 percent.

can only be as strong as its weakest component. Aggregates used in concrete generally have higher strengths than will be developed by the cement paste. In addition, aggregates are comparatively unaffected physically or chemically by the treatment they receive in concrete batching, placing and curing. On the other hand, both the physical and chemical characteristics of the cement paste are profoundly affected by the conditions encountered in all of these stages. Because of these factors, the strength of concrete is largely dependent upon the cement paste.

When cement and water hydrate or react with one another, the product is the cement paste which binds the aggregate together into a workable construction material. All cement paste is composed of water, unhydrated cement and the products of hydration, the latter being the only elements which contribute to structural strength. There are several products of cement hydration, but by far the most important is cement gel. Portland cement is composed mainly of four chem-

ical compounds (excluding gypsum which is used to control the rate of hydration). During the hydration process these compounds react simultaneously but at different rates, so that some reactions are completed while others are still in their initial stages. But the product formed by these several chemicals reacting at different times is, curiously enough, identical—cement gel.

First, let's consider a single gel particle. What is its shape? No one knows for sure, but many scientists at this time lean toward the belief that gel particles are fibrous. However, for convenience of illustration we shall assume that they are spherical. Although no one knows for sure, it is believed that the strength of a single gel particle is not great, even taking into consideration its microscopic size. It is probably the interaction of many particles that accounts for the considerable strength of cement paste.

The cement gel particle is termed a limited swelling gel. Cement gel is often compared with household gelatin, which is an unlimited swelling gel. They are both composed of extremely fine grains joined together by some unknown means to form a semi-solid material. However, when hardened gelatin is immersed in warm water, it absorbs a considerable quantity of water, softens, swells and becomes a liquid once again. Hardened cement gel, on the other hand, will absorb a little water and swell a minute amount when it comes into contact with water, but this absorption is limited chemically and never amounts to enough to affect strength or hardness.

What is the physical makeup of the cement gel particle? It has a nucleus of unhydrated cement surrounded by the products of hydration. As the cement hydrates the compounds covering the nucleus become progressively thicker and more impermeable. A point is ultimately reached when it is impossible for water to penetrate the covering to the core and the gel particle ceases hydration to all intents and purposes. It is this characteristic that explains the typical curves found in studies of concrete strength gain. Strengths climb fast during the first few days; but afterwards they level off, indicating that hydration has virtually stopped.

cement paste strength

As has been indicated, the strength and durability of the cement paste (and thus usually that of the concrete) hinges mainly upon the practices followed in batching, handling and curing.

When cement particles are immersed in water they disperse to fill entirely and uniformly the volume of liquid. This will hold true within the limits of water contents found in all concrete mixes. The more water that is used, the farther apart will be the gel particles formed, and the fewer and less extensive will be the points of bond between the gel particles. In this way, cement paste is much like the powdered household glues on the market; the more water that is added to them, the weaker will be the resulting glue.

While we know very little about the strength of the gel particles themselves, there is some evidence to indicate that it is the bond points between the gel particles which determine the strength of cement paste. The evaporation of what is called water of convenience (water needed for workability rather than for hydration) leaves spaces between the gel particles. These capillaries undermine the strength of the cement paste. This fact explains the water/cement ratio law. As the amount of water mixed with a given quantity of cement is decreased, the closer will be the gel particles and the more numerous and extensive will be the points of bond between them. Consequently, the strength of the paste will be higher. This denser material also offers greater resistance to practically all the factors which tend to deteriorate concrete. Since considerably less water can penetrate into it, damage by freeze/thaw cycles is dramatically reduced. Chemical attack is also reduced since there are fewer capillaries which can be penetrated by harmful solutions.

Since the combination of cement and water results in limited swelling gels, once the paste has dried out the rate of hydration is reduced markedly. Unlike the household gelatins, cement gels become practically impermeable once they have dehydrated and the core of unhydrated cement in the gel is virtually cut off from its supply of water. It is for this reason that proper, early curing looms so large on the quality concrete scene. Curing is largely a matter of preventing evaporation of water in the concrete, and all the available evidence indicates that the best results are obtained with uninterrupted curing. But inadequately cured concrete can be substantially improved by a resumption of wet curing, and this procedure should be followed even when considerable drying has taken place.

And so it goes on down the line of quality concrete laws. Each one is firmly rooted in the physical and chemical characteristics of cement paste and the aggregate used. It is dangerous to oversimplify, since the fields of concrete technology and research are so highly complex and controversial. Even from this casual look into the subject it is evident that we still have a great deal to learn. However, in most of the basic areas, which have the most important effect on practical field problems, the facts are clear. If you order quality ready mix, handle it properly and cure it well, you'll have a material which has no peer in the entire construction field. END

Here's a chance to test your I. Q. on an important phase of the concrete construction craft, and at the same time to learn about a new manual that belongs on your book shelf

Placing Reinforcing Bars

MORE THAN ANY OTHER MATERIAL of construction, concrete depends for its performance on the skill and understanding of the man on the job. Not only vast sums of money, but the safety of great numbers of people hinge upon the accuracy and fidelity with which the man on the job carries out the often complex instructions of the designer and the detailer. With concrete usage today being modernized at a rapid rate by daring new forms[1] and design concepts,[2] accuracy in the field is more important than ever before.

Since these observations all apply with particular force to reinforced concrete construction, it will be a matter of great interest to this publication's readers to know that a topnotch handbook is now available to clarify and facilitate communication regarding the placement of reinforcing steel. Although modestly titled "CRSI Recommended Practice for Placing Reinforcing Bars," this manual is actually an excellent textbook which should be considered must reading for both old timers and newcomers in the field of concrete construction. It was prepared under the direction of the Engineering Practice Committee of the Concrete Reinforcing Steel Institute by R. C. Reese, and a copy may be obtained by sending $3.00 to the Institute's headquarters at 38 South Dearborn Street, Chicago 3, Illinois.

In this article we have selected at random fifteen of the literally hundreds of questions which the manual answers as perhaps the most effective means of demonstrating its very practical and down-to-earth approach.

How many standard sizes of reinforcing bars are now being rolled? There are ten standard sizes ranging from #2 to #11 inclusive. All but the #2 size are deformed bars. There are also two larger special sizes (#145 and #185) which are not carried in stock. They are used mainly for column verticals.

What are the new bar numbers based on? They are based on the number of ⅛ inches included in the nominal diameter of the bar; i. e., the #8 bar has a nominal diameter of 1.000 inches.

Since bar diameters are nominal, is there any rule of thumb method for determining the actual outside diameter of a particular bar when its numerical designation is known? Yes, actual diameters may be determined accurately enough for most purposes by adding 1/16 inch to the nominal diameters of #3, #4 and #5 bars, ⅛ inch for #6, #7, #8 and #9 bars, and 3/16 inch for #10 and #11 bars.

What are stirrups and why are they used? Stirrups are U-shaped or W-shaped bars placed vertically around the main longitudinal reinforcing bars near the supports of a beam. They reinforce the beam against what is called diagonal tension.

(MORE)

This group of sketches shows the amount of concrete cover or protection which should be given to reinforcing steel under various circumstances. Each situation is described in detail in the text.

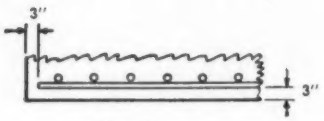


Fig. 1

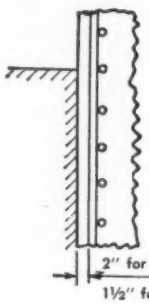


Fig. 2

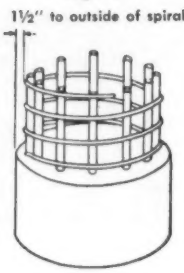
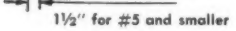


Fig. 3



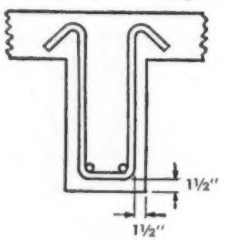


Fig. 4

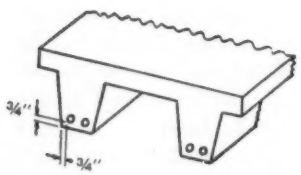


Fig. 5

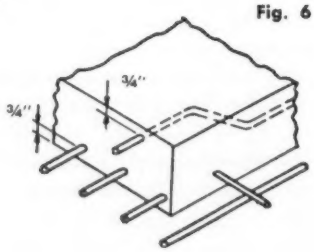


Fig. 6

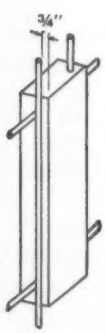


Fig. 7

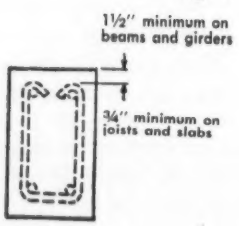


Fig. 8

How deeply should reinforcing bars be imbedded in concrete? The various common situations are indicated in the accompanying drawings. When concrete is cast against earth, as in the case of slabs on ground and the bottoms of footings (Fig. 1), at least 3 inches of cover should be provided.

When concrete is formed but is subsequently exposed to the ground or weather (Fig. 2), the following minimum cover should be given to reinforcing: 2 inches for bars larger than #5, and 1½ inches for #5 bars and smaller.

There must be a minimum cover of 1½ inches over all reinforcement in columns (Fig. 3). This same minimum also applies to the bottom and sides of beams or girders (Fig. 4).

There must be at least ¾ of an inch of concrete cover on the bottoms and sides of joists and on the bottoms of all floor slabs (Fig. 5). This minimum also applies to slabs (Fig. 6) and walls (Fig. 7) directly exposed to ground or weather.

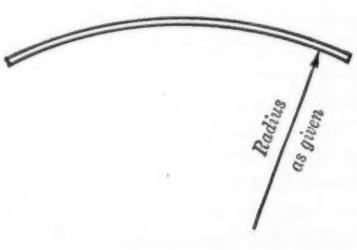
There must be minimum cover of 1½ inches at the upper face of any beam or girder and ¾ of an inch at the upper face of any slab or joist not exposed directly to ground or weather (Fig. 8).

In addition to the foregoing requirements there is a blanket stipulation that all reinforcement shall be at least one diameter away from any concrete surface.

Why are column spirals used? Column spirals serve the same purpose as column ties, but they restrain the concrete as well as the steel so that under load the column bends instead of cracking. A spirally-reinforced column is generally assumed to be 25 percent stronger than one without spirals.

When is radial bending done by the fabricator and when by the contractor? Radial bending is done by the fabricator when radii are equal to or less than those given in the table below. Bars of longer radii are generally delivered straight and sprung into place in the field.

#2	8 ft
#3	10 ft
#4	15 ft
#5	25 ft
#6	40 ft
#7	60 ft
#8	80 ft
#9	110 ft
#10	130 ft
#11	150 ft



This table shows for various sizes of steel reinforcing bars the maximum radii requiring radial prefabrication. For any given size bar any required radius of curvature greater than shown in the table can be taken care of in the field.

What is the reason for using column ties and what maximum spacing is permissible? The function of column ties is to tie the vertical compression bars together to keep them from buckling outward through the concrete. The table below shows maximum spacing of the three sizes of column ties for various vertical bar sizes.

Vertical bar size	Size and spacing of ties in inches Maximum spacing not to exceed least column dimension		
	#2	#3	#4
#5	10	10	10
#6	12	12	12
#7	12	14	14
#8	12†	16	16
#9	12†	18	18
#10	12†	18	20
#11	12†	18	22

† #2 ties are not recommended for #8 or larger verticals.

This table shows the size and spacing of column ties in inches for various vertical bar sizes. The dagger sign is to call attention to the fact that #2 ties are not recommended for #8 or larger verticals.

Should rust be removed from reinforcing bars before they are placed? A light covering of tight, yellow-brown rust or mill scale has no detrimental effect on the bond between concrete and steel. Indeed, some tests indicate that rust will augment holding capacity to some extent. It is important, however, to remove all loose, flaky rust by some technique (scraping, wire brushing or shock treatment) so that bond cannot be destroyed by bars slipping through the rust covering.

What are the more common types of ties used for holding reinforcing bars and how are they used? The accompanying schematic sketch shows six common types of ties. Fig. 9 illustrates the simplest type, often referred to as the snap tie, in which the wire is simply wrapped once diagonally around the crossing bars with the two ends on top. The ends are twisted with pliers until the bars are held tightly together, whereupon the loose ends are cut off and sometimes bent down to prevent snagging.

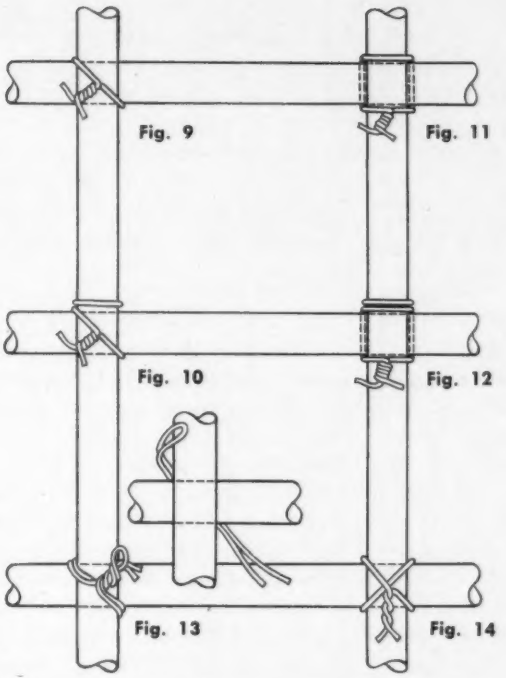
Fig. 10 shows a type of tie used on light vertical mats of steel in wall construction. It is made by encircling the vertical bar 1½ times, then passing diagonally around the intersection, and finally twisting the ends of the wire together to make a tight connection.

Fig. 11 shows a saddle tie, used in certain situations where it is desired to avoid the twisting effect that is inherent in the snap tie and the wall tie. The wires pass halfway around one of the bars on either side of the crossing bar, and are then brought either squarely or diagonally around the crossing bar.

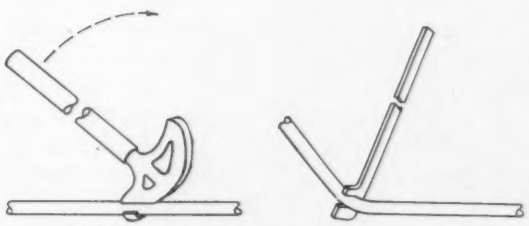
The saddle tie with twist shown in Fig. 12 is simply a variation of the saddle tie. It is used especially for heavy mats that are to be lifted by a crane. The wire is carried completely around one of the bars, then squarely across and halfway around the other, either side of the crossing bars, and finally brought together and twisted either squarely or diagonally across.

The double strand single tie shown in Fig. 13 is a variation of the simple tie. It is particularly favored for relatively heavy work.

The cross or figure-eight tie in Fig. 14 causes little or no twist in the bars.



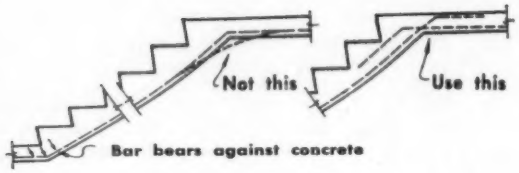
This schematic sketch shows some of the more common methods of tying reinforcing bars. Each of the six ties illustrated is described in the text.



Shown here are two types of the bending tools which bar setters call hickeys.

What is a hickey and what is it used for? A hickey (see sketch) is a hand tool with an open jaw in the side which can be used for bending reinforcing bars on the job site. It works quite effectively on bars up to #6 in size.

(MORE)



How to position reinforcing steel at stair landings to prevent unsightly breakouts when the bars tend to straighten out under loads.

What is the correct method of placing reinforcing bars around an inside corner? Since bars are supposed to act in tension, they should never be bent around inside corners. When placed in tension, a bar bent around an inside corner tends to straighten out and break away the concrete. Good construction practice requires that such bars be overlapped and extended to the far face for effective anchorage. This same rule also applies to stair landings as shown in the accompanying sketch. At the top of a flight of steps bars should be lapped, one continuing on into the top of the landing and one other continuing across into the top of the stair slab. At the bottom of the flight, however, it is permissible to bend the bars around the corner since the bend bears against the concrete.

What tolerances are permissible in the placing of reinforcing bars? Tolerances can be an important consideration in the placing of reinforcing. For example, the live-load capacity of a 6-inch deep slab could be reduced as much as 20 percent by raising the bars as little as ½ inch. A variation of plus or minus ¼ inch is acceptable in respect to the height of bottom bars above forms.

Fortunately the lengthwise positioning of bars is not as critical as vertical positioning. Since the fabricator is usually allowed a tolerance of plus or minus 1 inch in the length of bars, a variation of plus or minus 2 inches is generally considered permissible in the lengthwise positioning of bars.

The exact spacing of bars in walls and solid slabs is far less important than assuring that in any given length or panel of slab or wall there are as many bars as the design calls for. Thus it is far better to shift a bar an inch or two, or sometimes even more, to clear an obstruction or opening, than to cut the bar. Subject to such exceptions, however, reasonably uniform spacings are considered desirable from the standpoint of appearance and ease of inspection.

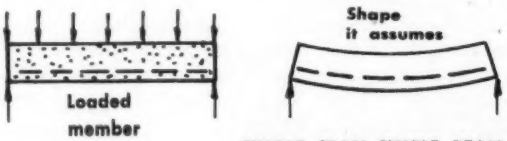
Top bars should be positioned within ¼ inch or less of the height called for, since here again the strength of the beam can be seriously affected. If top bars must for any reason be lowered more than ¼ inch, it is important that a determination be made of the effect upon the strength of the beam, and an appropriate increase be made in the size or number of reinforcing bars. For example, if bars must be lowered 1 inch in a beam 12 inches deep, the total area of the steel should normally be increased about 8 percent; i. e., in the ratio of the variation (1 inch) to the depth (12 inches). If this were not done, the strength of the beam would be reduced in about the same proportion.

A variation of 1 inch is considered permissible in the placement of stirrups, with the restriction, however, that such variations must not be permitted to accumulate. That is to say, each stirrup in a group must be within 1 inch either way of the location called for by the design.

Are there any general rules or principles which apply to the location of reinforcing bars in various types of structures? There are indeed. The accompanying drawings show some of the more common types of loaded members, the shapes they assume when loaded, and the approximate location of reinforcing to resist the tensile (stretching) stresses. In general it may be said that bars should be located on the convex side (or outside) of the curve which the member assumes under load.

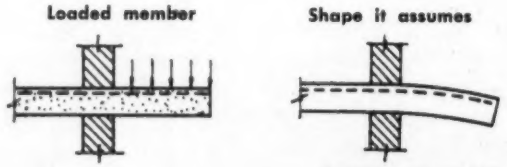
The simplest case is the single span simple beam supported at the ends as shown in Fig. 15. This

For each of the several types of concrete members shown here in sketch form, there is a companion sketch showing the shape it tends to assume when loaded. Each situation is discussed in the adjoining text.



SINGLE SPAN SIMPLE BEAM Fig. 15

CONTINUOUS BEAMS Fig. 16



CANTILEVER BEAM Fig. 17

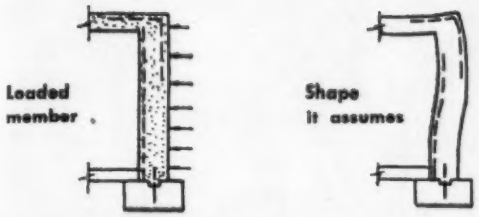


Fig. 18 WALL SUPPORTED BY FLOORS

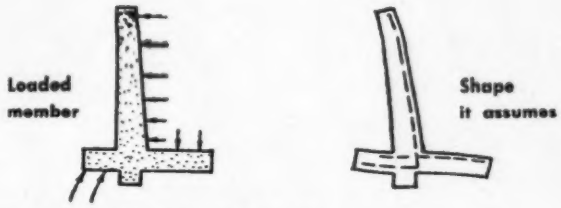


Fig. 19 CANTILEVER RETAINING WALL

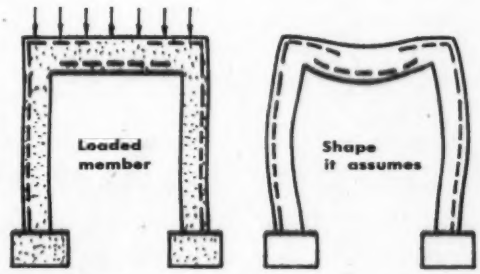


Fig. 20 ELASTIC FRAME

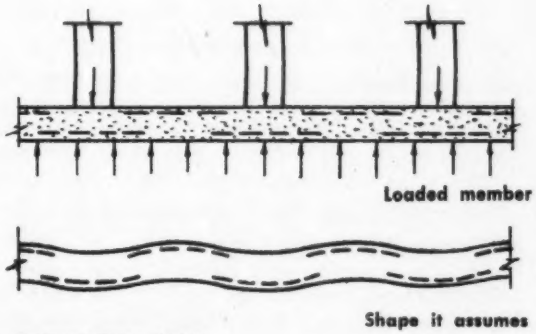


Fig. 21 FOUNDATION BEAM

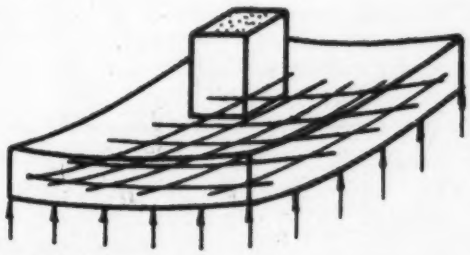


Fig. 22 COLUMN FOOTING

basic member requires reinforcing bars near the bottom of the beam and for the full length.

Continuous beams are those which have three or more supports. In the simplest form shown in Fig. 16, this type of beam is shown to sag between the end supports and the intermediate supports and to hog over the intermediate supports. Tension steel is therefore required near the bottom between supports and near the top over intermediate supports.

Fig. 17 shows a simple cantilever beam, free to deflect at the free end and restrained from rotation at the support. Note that the tension reinforcing bars are located near the top. In short cantilevers all the bars may extend to the outer end, whereas in longer cantilevers it is customary for the top bars to be graduated in length, with only every second or third bar extending all the way to the free end.

A foundation wall, supported by floor slabs at both top and bottom and loaded horizontally by earth pressure, is shown in Fig. 18. Since the tendency of this type of wall is to bow inward, reinforcing bars should be located near the inside face, and possibly also around the outside top corner if the wall and the top slab are monolithic (cast in one operation). Obviously backfill should never be placed against a wall designed in this way until both the top and bottom slabs are completed.

Cantilever retaining walls deflect as shown by the sketch in Fig. 19, and the reinforcing should be located as shown.

The elastic frame, sometimes incorrectly called the rigid frame, is shown in Fig. 20. It requires bars in the outside of the vertical legs, in top at the corners, and in the bottom at the center of the horizontal beam.

Foundation beams are simply inverted continuous beams loaded by upward earth pressure on the bottom and by downward column loads on the top. As shown in Fig. 21, reinforcing bars should be located in the top between columns and in the bottom under columns. Bars should not be spliced within the areas shown by the dotted lines.

A simple square or rectangular footing, such as the one shown in Fig. 22, has a concentrated column load downward in the center, and more or less uniform soil pressure acting upward all over the base. A footing of this type tends to curl upward toward each of the corners, and it should therefore be reinforced with a mat of bars running in two directions at right angles and located near the bottom. END

1. See "The Hyperbolic Paraboloid," Concrete Construction, January 1959, page 1.

2. See "Ultimate Strength Theory Modernizes Concrete Design," Concrete Construction, January 1960, page 5.

Ready mixed concrete trucks in a constant stream service machinery that casts concrete pipe in a new continuous process. The method uses an inflatable inner form and a mobile outer form.

Casting Concrete Pipe in Place

An inflatable rubber and fabric hose-like concrete form is the key to the patented process for pouring concrete pipe at a rate of 8 to 12 feet a minute. The inflatable form shapes the inside of the pipe.

A NEW CONTINUOUS FORMING MACHINE that casts concrete pipe in a freshly cut trench at a rate of 8 to 12 feet a minute has been developed by a company in Phoenix, Arizona. Currently being used to build conduits for irrigation water on farms near Phoenix, the new construction process is also adapted to the building of storm sewers and other types of concrete pipe. The technique eliminates joints and seams, and is said to cut construction time and overall costs.

Inflatable rubber and fabric forms, made from blimp-type materials, are part of the continuous operation system. Using two 300-foot inflated forms with only 3 pounds per square inch of air pressure, as much as 600 feet of concrete pipe can be cast without interruption. It is possible to line up forms for runs in miles. Ready mixed concrete trucks are used in a continuous stream to service the equipment.

Developed over the past nine years, the construction process consists mainly of a double-hoppered forming machine that is pulled along the rounded bottom of a ditch, while enveloping an inflated inner form.

The inflatable inner form is picked up by the

Controls for a new system to cast concrete pipe in a freshly cut ditch in a continuous process are shown in operation. A self-aligning winch draws the forming machinery along the rounded bottom of a ditch. Electric controls for the process are located at the forming machine.

outer form so tamping devices can literally tuck concrete under it. Half of the double hopper, activated by electrically driven tampers, shoves concrete into the bottom of the ditch, while the other half is forming the top of the pipe.

The hose-like, inflatable form, constructed of two plies of cotton fabric coated with neoprene rubber is open at both ends to hold airtight bulkheads through which air pressure is applied for strength. The inflatable form is easy to handle and can be deflated for extraction about 2 hours after the concrete has been placed. This makes it possible to use the same form several times a day.

Machinery containing the outside form for concrete pipe is set in the ditch and one end of the inflatable form is passed through it with bulkheads at both ends. When air pressure of the inner form is 3 pounds, the pipe-laying process is ready to begin.

As concrete is discharged from the ready mix truck into the machine's double hopper, the forming machine is drawn forward by a cable on a winch. An electric motor on top of the machine operates the tamping devices that distribute concrete uniformly and tightly around the inner form.

The inventor has developed inflatable forms in lengths from 50 to 300 feet and has laid pipe from 12 inches in diameter to 48 inches. He is now working on a machine and inflatable form to lay 60-inch pipe.

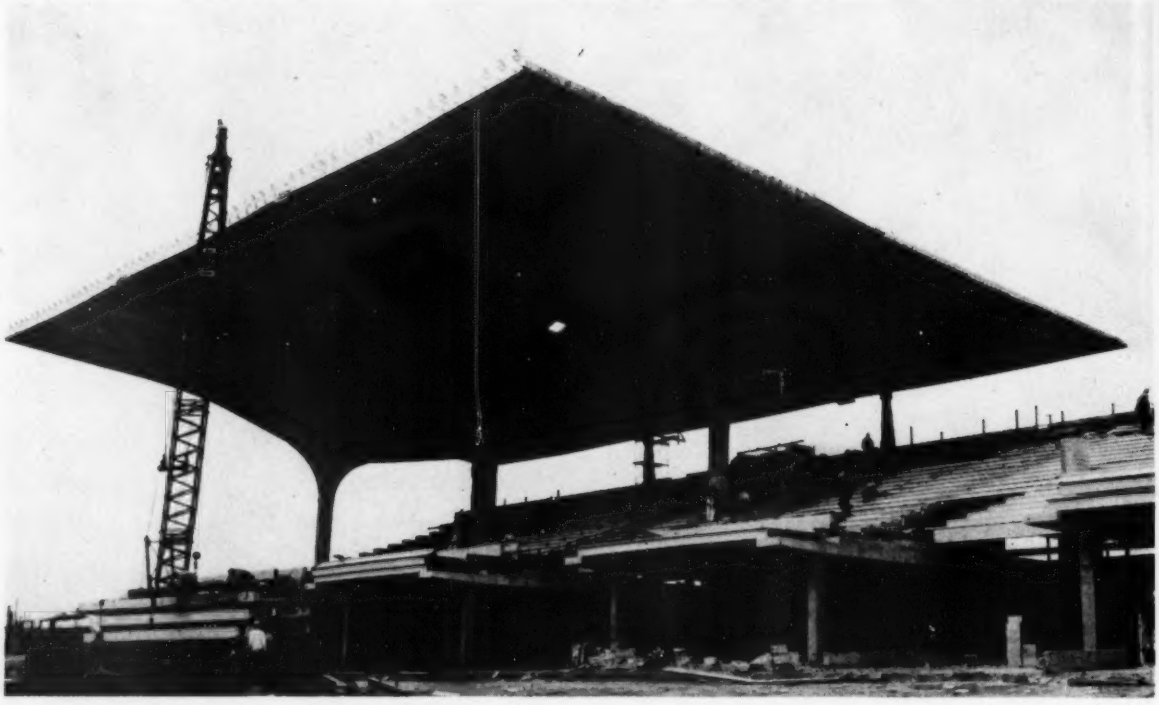
According to Arizona Testing Laboratories, the system and the finished products meet Bureau of Reclamation standards for Arizona. The concrete conduit, made with the first inflatable-deflatable pipe form, exceeded Bureau weight-test requirements by 4 tons and compression strength by 520 pounds per square inch.

Although the first commercial installations have been limited to irrigation pipe lines, it is believed the new pipe building process is not confined to this field. Work is in progress with the city of Phoenix on plans to lay storm sewers with the new system and to adapt it to the vast sanitary sewer and other concrete pipe markets. END

Readers who would like to have additional information on the subject discussed in the foregoing article may request it by circling No. 357 on one of the reader service cards in this issue.

ABOVE: Close-up of a section of concrete pipe cast by the new process in a freshly cut ditch.

BELOW: Concrete from a ready mix truck is here shown being discharged into the supply hopper of the pipe-forming machine. Speeds range from 8 to 12 feet a minute.



These giant hyperbolic paraboloids help lure spectators to the new Scioto Downs racetrack in Columbus, Ohio, while providing an economical shelter over the grandstand.

Largest Inverted Umbrella Roof

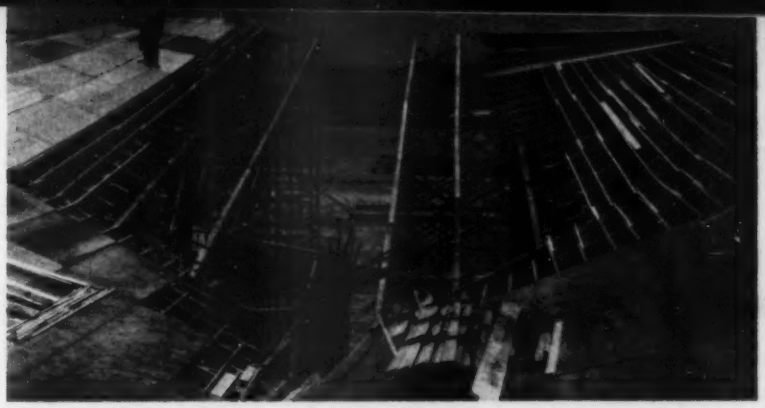
ONE OF THE MOST DRAMATIC and photogenic utilizations of hyperbolic paraboloid shells undertaken to date is the Scioto Downs racetrack grandstand, shown under construction in the accompanying pictures. When completed, the five 60- by 116-foot shells will very probably comprise the world's largest umbrella-type roof. Extensive use of other forms of reinforced concrete throughout this project serve to point up the growing dominance of concrete in all types of modern construction.

What the designers sought and obtained was a structure which combines spectacular appearance with lowest possible maintenance cost. When the project is completed, they will also have achieved the remarkable feat of creating a modern grandstand capable of seating 2,600 people, and a 100- by 160-foot clubhouse for an estimated bargain counter cost of $750,000.

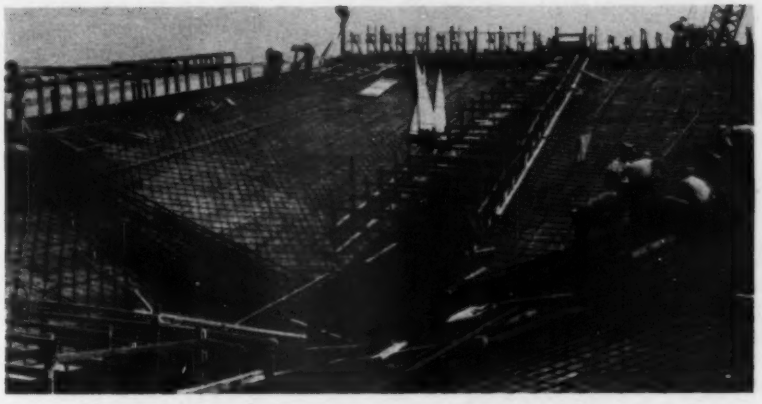
Three of the five grandstand roof shells were completed during the summer of 1959, while the remaining two are slated to be built early this year. The shells tilt backward 12 feet from the front edges, which rise 65 feet above the track. The concrete in front of the 36-inch diameter reinforced concrete columns is 5 inches thick, while that in back of the columns is only 4½ inches thick.

Stiffening is provided by two main ribs, one in each primary direction. These taper from a maximum thickness of 25 inches at the center to about 12 inches at the edges. Edge beams measuring 20½ inches in height and 16 inches in width extend around each shell to control corner deflection. Additional stabilization for each shell is provided by a concrete post which is tied to the grandstand frame 24 feet from

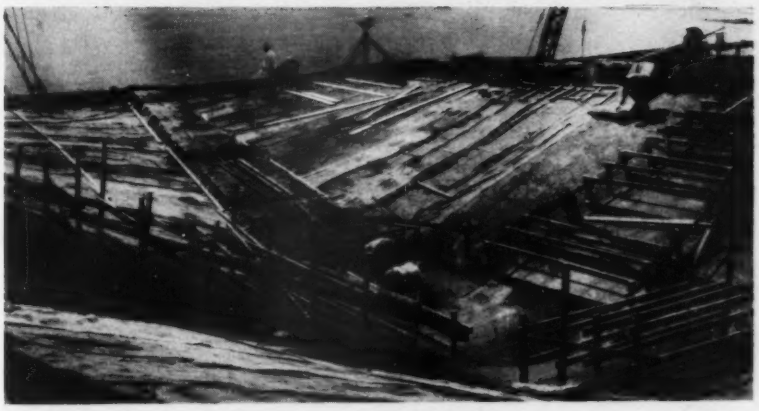
View down center of roof form when two-thirds completed shows steel in place for supporting column. Roof form consisted of a grid of 4 x 6's and 2 x 6's covered with 4 x 8 sheets of ¾-inch plywood.



Roof shell was reinforced with network of steel rods. Heavy bundles went into stiffening ribs and edge beams.



Curing with wet burlap was begun immediately after concrete was placed and finished.



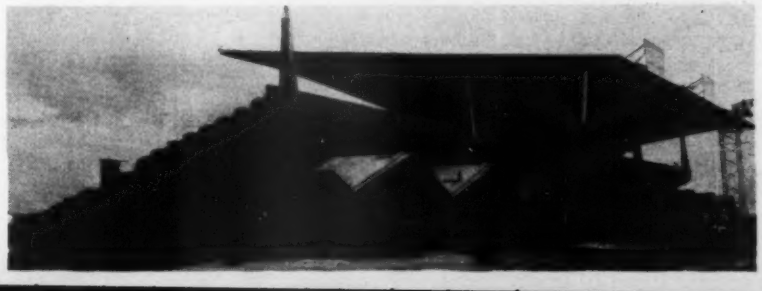
LOWER RIGHT: View from southwest corner shows graceful lines of large concrete umbrella shells, as well as the complex of scaffolds to support the forms for the shells.

the rear edge.

The project also features two major uses of folded plate concrete roof construction — one (visible in the photographs) located under the grandstand, and the other (not shown) covering the clubhouse proper.

Over 1,400 cubic yards of ready mixed concrete was required for the hyperbolic paraboloid and folded plate roof structures alone, while the project as a whole accounted for about 7,000 cubic yards. The cast-in-place grandstand frame supports decking, risers and treads consisting of precast, prestressed concrete. END

BELOW: Betting windows on mezzanine floor are covered by folded plate roof beneath seating slope and umbrella shells.



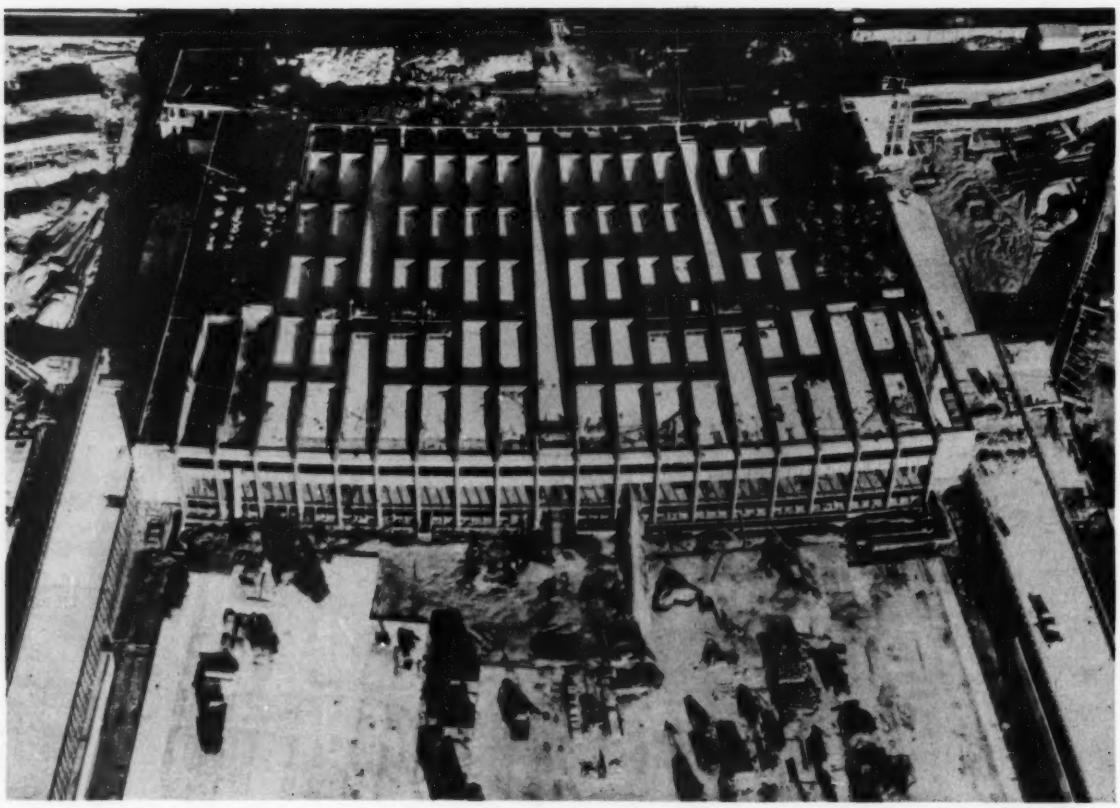
Controlled uniformity in lightweight concrete with PLASTIMENT

To overcome variations in ambient temperatures and to maintain specified design strengths, Plastiment Retarding Densifier was used in approximately 20,000 cu. yds. of lightweight concrete placed in the sprawling new $20-million Eastern Air Lines Terminal at New York's Idlewild Airport.

The terminal's 16 massive roof girders, spaced on 15 to 18-ft. centers, rise 9 ft. at the center of the span. Although only 126-ft. spans were required, it proved more economical to design continuous 230-ft. girders. Each continuous girder was cast as a single homogeneous member in a 10 to 12-hour working day. Plastiment increased workability and kept the mix plastic during the extended placement period preventing form deflection cracks and cold joints. Starting at the opposite ends of the form, concrete was fed alternately through side ports and consolidated by vibration. The quantity of Plastiment was varied according to ambient temperatures to produce dense, uniform quality concrete.

Usage of lightweight aggregate in the mix cut the deadweight of the structure (above the first-floor slab) approximately 22%. Specified 3-day strengths of 2,500 psi and 28-day strengths of 3,000 psi were exceeded. Rapid strength gain made possible early stripping of forms in spite of extreme set retardation.

Plastiment features are detailed in Bulletin PCD-59. Ask for your copy. District offices and dealers in principal cities; affiliate manufacturing companies around the world. In Canada, Sika Chemical of Canada, Ltd.; in Latin America, Sika, Panama, S. A.



Owner and Operator: Eastern Air Lines; Architect: The late Chester L. Churchill. Work is now being carried to completion by Albert C. Grey and associated architects and engineers; Consulting Engineers: Seelye, Stevenson, Value & Knecht; General Contractor: The Gilbane Building Company; Ready-mix Supplier: M. F. Hickey Company, Inc.; Photos: Rothschild Studios.

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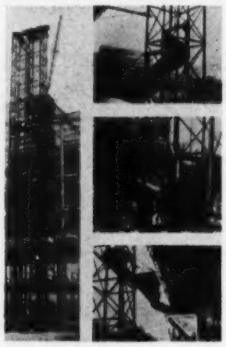
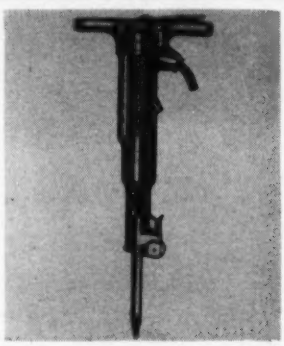


material towers 325

Safety, economy, versatility and efficiency are claimed for a line of single-well and double-well towers. Platform may be removed for conversion to concrete handling or passenger elevator equipment. Available in 3,000- and 5,000-pounds load capacities. Either model accommodates two wheelbarrows or concrete carts. Tubular Structures Corp. of America, 2960 Marsh St., Los Angeles, Calif.



paving breaker 326

Heavyweight paving breaker is designed for heavy demolition. Weight, balance and smoothness favor the operator, progressive throttle valve simplifies starting moils under adverse conditions, and features like the bushed front head and throttle valve combined with blu-coated parts assure prolonged efficient operation at minimum maintenance costs, according to the manufacturer. Worthington Corporation, Holyoke, Mass.

products

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sealant 327

No etching is required before using a sealant described in folder 15N8R. It prevents dusting, gives concrete a surface that is non-slippery and waterproof and keeps dirt and grease out of pores. It does not wrinkle, check or chip from build-up. Floors can be sealed immediately after they have set, and the seal slows up drying so that floors will cure properly. Colors may be added to the sealing compound, or the sealed surface may be painted. Asphalt tile adheres readily to the sealer. Huntington Laboratories, Inc., Huntington, Ind.

joint sealer 328

Jet engine blast during warm up and take off on jet-operational airfields causes almost instant decomposition of many sealants in expansion and control joints. Deterioration of joint sealing materials results in associated problems of spalling and disintegration of concrete along the areas adjacent to joints; pebble and dirt imbedment which causes structural cracking at weak points in the slab; seepage of water which causes erosion of the underlying soil; and subsequent failure of the runway under impact of aircraft. A liquid rubber joint sealing compound to which a curing agent is added just prior to installation is said to eliminate these problems. It remains semi-fluid for a sufficient period of time to permit application to the concrete joints, and then rapidly cures to a solid rubber states, adhering intimately to the sides of the joint. Chem Seal Corporation, 12910 Panama Street, Los Angeles, Calif.

products

For additional information circle matching key number on reader service card on page 72A.

snow melting systems 329

Installation pictures and complete technical data are presented in a 36-page catalogue on snow melting systems. Both residential and commercial installations are included. A. M. Byers Company, P. O. Box 1076, Pittsburgh, Penna.

vapor barriers 330

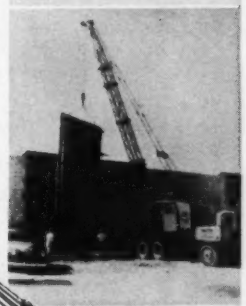
A vapor barrier material consists of aluminum foil and kraft paper bonded together with a flame extinguishing adhesive and reinforced with fiber glass strands. This basic kraft to foil material can be supplied with various weights of paper, thickness of foil, and amounts of reinforcement, and also in foil-to-embossed kraft, either black or white, and in foil to foil barriers. Advantages cited by the manufacturer are flame resistance, vapor-proofing characteristics, strength and durability, low cost and attractive appearance. American Sisalkraft Corporation, Attleboro, Mass.

sealer 331

An epoxy-based liquid coating is said to penetrate deeply into the porous surface of old or new concrete floors to provide an excellent sealing protection against traffic wear and corrosive deterioration. It can be applied with an ordinary paint brush, paint roller or spray gun for as little as two cents a square foot. After overnight hardening, it develops a glossy, tough and flexible protective skin which prevents dusting or granulation of concrete surface. Permagile Corporation of America, 34-43 Fifty-Sixth Street, Woodside, N. Y.

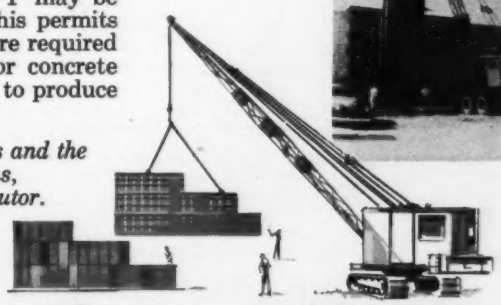
AIRBORNE UNI-FORM PANELS

smart way to speed concrete forming...



Forming speed and economy can be greatly increased by crane handling big monoliths of UNI-FORM Panels. Contractors with repetitive section forming requirements are finding that the design of UNI-FORM Panel monoliths—in which metal filler angles are used between each panel—give them greater versatility and wider application. For example . . . tie rods of any size from ½" to 1" may be used to tie two monoliths into a wall form. This permits using the right tie size for the job. Fewer ties are required and sections can be placed, tied and ready for concrete faster. Panels may be added or removed at will to produce any monolith required.

For complete information on UNI-FORM Panels and the UNI-FORM System in crane handling operations, write today, or ask your nearby Universal Distributor.



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products

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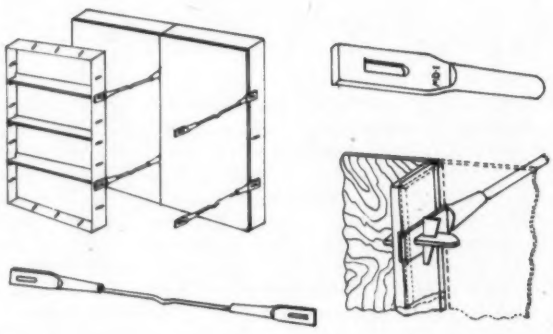
snow removal unit 332

Easy removal of ice and snow from sidewalks is accomplished by heat generated from vinyl insulated wiring imbedded in concrete. Heating wire is taped to reinforcing wire in loop fashion prior to placing top layer of concrete over the units. Easy installation and low operational cost are claimed by the manufacturer. Edwin L. Wiegand Company, 7500 Thomas Boulevard, Pittsburgh 8, Pa.



form tie 333

Diagram shows re-usable tie designed specifically for gang forming with Symons panels. Quick, positive disconnection of tie through its double lead thread has led to faster erection and stripping of ganged sections in field tests. The tie has a working load of 4,000 pounds and an ultimate tensile strength of 6,000 pounds. Outer unit of the tie is of one-piece construction and easily removed for re-use. Williams Form Engineering Corporation, 1501 Madison Avenue, S. E., Grand Rapids, Mich.

How to Stretch a Buck... Use

Symons Steel-Ply Forms

Your investment in forms can pay off in extra dollars saved when you use Symons Steel-Ply Forms. It's because Symons Steel-Plys are designed and built with performance features that cannot be found in other forms.

Completely Interchangeable

Any combination can be used . . . side by side or one on top of the other, for any length or height of wall. Panels can be removed and replaced at any point . . . this simplifies erecting and stripping.

Weight 5 Lbs. Per Square Foot

When considering forms, the weight of the form is an all-important consideration. Because of the efficient methods developed for erecting and stripping forms, handling is an important part of the labor cost. Symons Steel-Ply Form weight of 5 lbs. per square foot means a significant cut in form labor costs. Handling costs are also reduced because all Symons Steel-Plys are equipped with handles for easier and faster handling.

Ties To Fit The Job

With Symons Steel-Ply Forms you can get the tie that will be most economical for your particular job. For rough work where appearance and break-back are not important you can use the Symons flat tie. When clean-cut foundations and easy positive break-back are required, Symons Steel Rod Ties with 1" break-back are the answer. And, for special gang forming, Symons She-Bolt Ties with 1½" break-back are available.

37,000 square feet of steel-ply forms used on the Air Force Academy, Colorado Springs, Colorado.

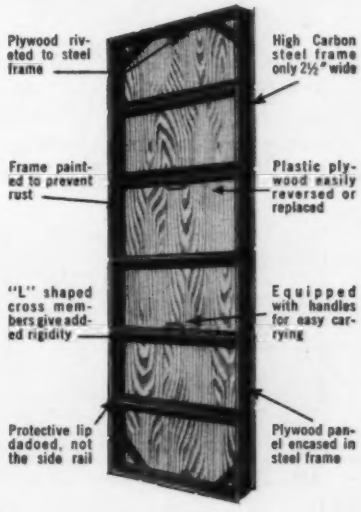
CIRCULAR WALLS were formed by ganging steel-ply forms. Four ganged sections 22' wide by 28' high were used to pour a third of the sewage treatment tank at one time.

Connecting Bolt and Wedge

For connecting hardware a bolt and wedge are used. With these two pieces you can fasten two forms together and insert the tie faster than driving a nail. Brace plates, scaffold brackets and waling hardware are also fastened with the bolt and wedge. This eliminates the need for dogs, nuts and bolts, lugs, vise grips, special tools, as well as complicated and expensive ties. The only tool needed is a hammer.

Adaptable For Every Type Construction

Contractors who use Symons Steel-Ply Forms can bid on almost any type concrete job. They are adaptable for straight, circular, battered, cut-up and "Y" walls. Try Symons Steel-Ply Forms on your next job; they can be rented with purchase option.



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products

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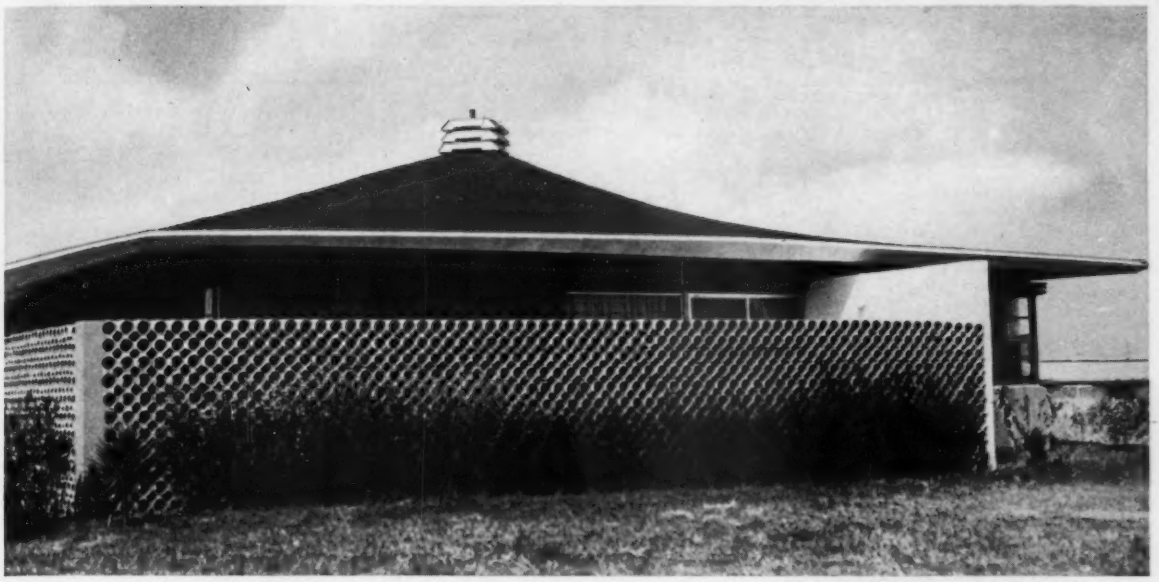
vibrator 334

A 16¼-pound electrically powered concrete vibrator can be slung over shoulder in a harness, eliminating long flexible shafts and need for moving heavy engines. Model produces 10,000 vpm. The 1-5/16-inch head works well for narrow forms and between reinforcing bars. Whiteman Mfg. Co., 13020 Pierce St., Pacoima, Calif.

bactericidal concrete floor 335

A concrete floor containing an insoluble bactericidal agent which retains its full efficiency for the life of the floor is expected to reduce maintenance and increase sanitary conditions by killing acid-producing bacteria which grow in ingredients spilled on the floors of food plants, causing pitting of concrete. These floors will also prove useful in hospitals in helping to control outbreaks of infections from Staphylococcus aureus. The floors may be permanently colored for decorative purposes. Kalman Floor Company, 110 East 42nd Street, New York 17, N. Y.



UMBRELLA ROOF, of ready mixed concrete, is poured-in-place. Forms are stripped after 7 days. Entire load of 72,000 pounds is supported by one 18" square center column. Builder: Harold Hessel. Architect: Duane Conner, Oklahoma City.

Hyperbolic paraboloid moves to suburbs

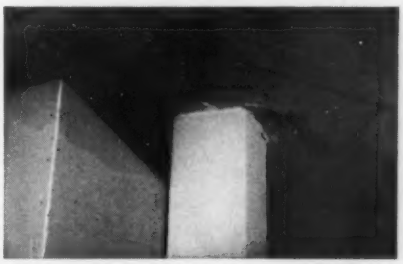
HYPERBOLIC PARABOLOID concrete roofs, so popular in modern commercial construction, are proving equally functional and economical for homes. An Oklahoma City builder offers a choice of two design variations, both of which provide substantial cost savings. One is an umbrella roof with single center support, the other a free design paraboloid roof supported at the four corners.

Thickness of the concrete roofs (3") and amount of reinforcing (⅜" bars, each 9") are controlled by local building code. Actually, the structural strength of the hyperbolic paraboloid design would permit lighter construction. Even so, the cost is below that of conventional methods.

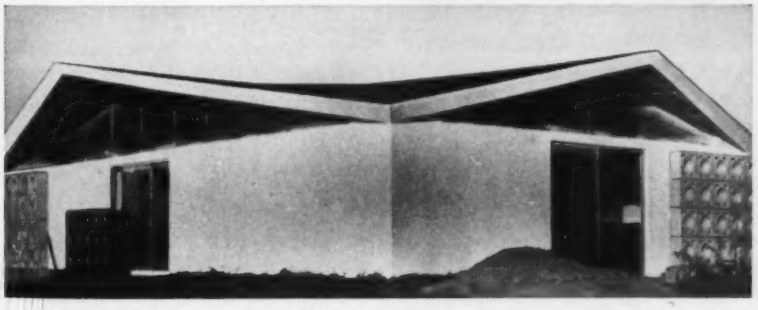
Foundation work also costs less. 24" piers with 36" bottoms, spaced 8' c-c on 10' deep foundations, are poured without forms. Non-load-bearing walls, of foam concrete, are cast on the floor slab, then tilted into place. Walls rest on 12" piers, spaced 25' c-c.

Roof forms are reusable plywood. Lightweight concrete is placed by crane. Only about two hours are required to place an entire roof. An ordinary lawn sprinkler on the roof keeps it wet down for two or three days during the curing.

SINGLE CENTER SUPPORT for umbrella roof will be surrounded by house storage area. Note 4' square at top of column, where roof steel crosses.



FREEDOM OF INTERIOR DESIGN is offered by hyperbolic paraboloid roofs supported only at four corners. Glass is placed between wall panels and roof. Built-up roof edges carry water to drains in corner columns.



The use of several types of concrete in these homes is no problem. Each is properly processed and delivered to meet the builder's schedule by truck mixers of certified design, capacity, mixing speed and water control accuracy.

products

For additional information circle matching key number on reader service card on page 72A.

scaffolding 336

New, 8-page bulletin, J-11, tells how scaffolds meet many of today's needs in new construction, building maintenance and repair, and industrial operations. Profusely illustrated material covers waterproofing buildings, bridge stone repair, concrete finishing, stone mason's monorail systems, curtain wall construction, and many other light-duty jobs. Patent Scaffolding Company, Inc., 38-21—12th St., Long Island City, N. Y.

prestressing 337

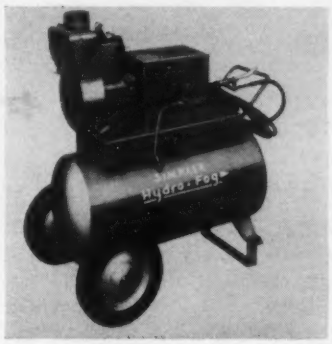
Catalogue shows many standard applications of prestressed concrete. Pretensioning, posttensioning, varying the eccentricity of prestressing tendons in beams, and circular prestressing are subjects of the sections of this comprehensive, 53-page book. American Steel & Wire Division, United States Steel Corporation, Rockefeller Building, Cleveland 13, Ohio.

technical films 338

Specialized, 16 mm. sound films about new products, advanced industrial processes and cost-saving techniques are available on free loan to technical groups and business and professional audiences. Subjects include research and development, modern steelmaking, plastics, die-casting, infrared spectroscopy, compressed air power application, forging and grinding techniques and other subjects in the fields of architecture, civil engineering, construction, metal trades, and chemical and petroleum industries. Catalog from Modern Talking Picture Service, 3 East 54th Street, New York, N. Y.

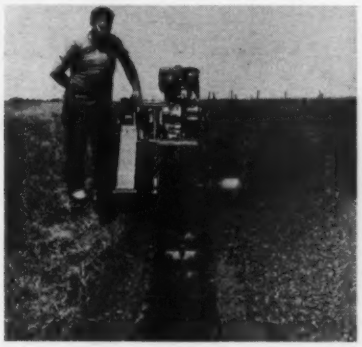
products

For additional information circle matching key number on reader service card on page 72A.



spray equipment 339

For spraying forms, curing compounds or masonry waterproofing, the Simplex Hydro-Fog is available in 3 models, power driven by either a 2 hp, 4-cycle gasoline engine or an electric motor. It produces a fine mist at a pressure of 300 psi. Hydraulic operation eliminates danger of explosion and wait for pressure build up. Simplex Forms System, Inc., 5603 Industrial Avenue, Rockford, Ill.



trencher 340

Twelve horsepower model Ditch Witch cuts trenches to 5-foot depths and 12-inch widths. Can be used for foundation footings, sewer laterals, drain fields (double cut trench), water lines to 5-foot cover, and other ditching operations. Operates in any soil and under rugged digging conditions. Witch Marketing Co., 1959 W. Fir Ave., Perry, Okla.

HOW TO RUB or GRIND CONCRETE

Today, more and more builders specify a fine finish for concrete walls and ceilings. Because of this new requirement, and of the time and expense involved for hand finishing large areas, Stow Manufacturing Company has developed two easily portable flexible shaft grinders for finishing concrete. These grinders are electrically powered.

Two methods are used to smooth off hardened concrete: wet rubbing and dry grinding. Wet Rubbing—required for smoothing green concrete to a plaster-like finish. Use slow speed grinding wheel or disc. Apply water while grinding. Wet concrete can also be painted on with a brush, then smoothed into holes with the grinding wheel. Dry Grinding—use a high speed grinding wheel or abrasive disc to smooth dry concrete.

Either of Stow's portable, electric grinders, the ½ HP model G40-C or the ¾ HP model JT-50, can be used for wet or dry grinding. Both models are available with open or totally enclosed motors, and are equipped with 8 or 12-ft. flexible shafts. Angle heads with different speed ratios can be selected. Write for STOW's pamphlet, Grinding Concrete, for complete information on proper speeds, grinding discs and wheels for both wet and dry concrete finishing. Stow Manufacturing Co., Binghamton, N.Y. also makes a complete line of concrete vibrators, rotary trowels, and screeds.

STOW MANUFACTURING CO., Dept. A-1
354 Shear St., Binghamton, N. Y.

Please send me your pamphlet, GRINDING CONCRETE.

Name.....Title.....

Company.....

City.....Zone....State.....

Circle 316 on reader service card

products

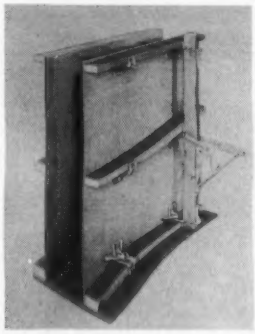
For additional information circle matching key number on reader service card on page 72A.

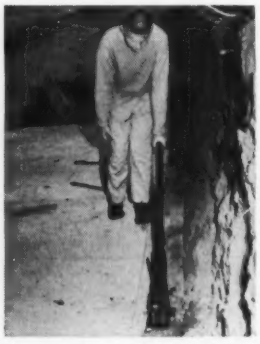
detector 341

A device locates and traces pipes, cables and conduits to a depth of 18 feet. It can also be used to measure the depth of a line, and to pinpoint valves, caps, risers, and junction boxes. Eliminates guesswork and costly excavation. Completely transistorized, the unit is lightweight and requires only small flashlight batteries for power. Goldak Company, 1544 West Glenoaks Boulevard, Glendale, Calif.

forming system 342

Two types of heavy duty breakback ties, a cam-lock tie bracket, a stiff-back cam and a scaffold bracket are included in this concrete forming system designed to handle all types of construction from light to very heavy. System will integrate with present systems from this firm and widely expand their applications. Gates & Sons, 80 S. Galapago St., Denver 23, Colo.



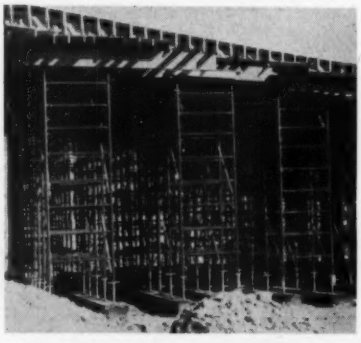


stake puller 343

Stake puller exerts 5,000 pounds pulling pressure when operated by 150-pound workman. It operates on a fulcrum principle which is adjustable to six positions allowing workmen to reach high and low stakes. It also pulls wooden stakes and steel pipe, angled stakes and horizontal rods. Holland Mfg. Co., 920—15th Ave., East Moline, Ill.

steel shoring 344

First state-approved use of steel shoring to support bridge slabs in Minnesota is shown here in construction of interstate bridge at Red Wing. Steel shoring, made up of standard 4-foot wide steel panels each designed to carry a load of 20,000 pounds, was used as falsework. Waco-Porter Corp., 3656 Wooddale Avenue, Minneapolis 16, Minn.



products

For additional information circle matching key number on reader service card on page 72A.

home insulation 345

A 24-page reference manual on home insulations for use by architects, designers, builders, contractors, dealers and others interested in the part insulation plays in residential comfort and economy offers design principles, design standards, application standards, tabulated data and product information. Owens-Corning Fiberglas Corporation, Toledo 1, Ohio.

formboard 346

Designed for perlite, vermiculite or gypsum poured roof decks, a multipurpose formboard also provides low-cost noise control, high thermal insulation value and an economical finished interior according to the manufacturer. Available in 4 different finishes in a variety of widths and lengths. All types may be painted without causing any appreciable loss of acoustical quality. Simpson Logging Company, 1033 White Building, Seattle, Wash.

scaffolding 347

Contractors will be interested in a folder which covers Auto-Lock self-fastening head, light and heavy duty rolling scaffolds, Reddi-Roll scaffold for painting and drywall work, Fold-A-Way rolling scaffold, concrete construction, shoring and masonry scaffolds, and a line of jacks. Technical data on how to brace for height, how to apply multiple bracing on frames, how to scaffold flat, sloping and unusual ceilings is included. Superior Scaffold Company, 5624 Bankfield Avenue, Culver City, Calif.

products

For additional information circle matching key number on reader service card on page 72A.

marking device 348

A marking device especially for the building trades will write clearly and durably on concrete, rough lumber, metals, wall materials, masonry, wirings, fibre boards, and all natural and synthetic compositions. It has an instant valve-action head on an unbreakable, refillable polyethylene squeeze bottle container. Speedry Products, Inc., P.O. Box 97, Richmond Hill, Jamaica, N. Y.

waterstop 349

A rubber waterstop is spliced by chemical bonding rather than by heat or vulcanizing. Only a small splicing kit and a simple clamping device are needed. Manufacturer claims a watertight seal, even when movement occurs in concrete joint. Waterstop is used to prevent seepage in dams, power stations, pumping and water stations, canals, reservoirs, tanks, wall base joints, bridge abutments, building foundation walls and swimming pools. Gates Rubber Company, 999 South Broadway, Denver, Colo.

joint curing tape 350

Concrete joint curing tape consists of two ribbons of special adhesive, applied to a polyethylene tape, equidistant from center, and protected by a glassine backing. During application backing is snapped off and tape pressure-applied so as to straddle joint. Manufacturer claims that tape prevents loss of moisture essential to curing of sawed or formed joints, reduces spalling, prevents infiltration of foreign matter, and eliminates re-sawing, blowing of joint with compressed air, wire brushing, or hooking out of incompressible materials lodged in joints. Presstite Div., American-Marietta Co.

truck crane 351

A 20-page catalogue, 732-TG-2, describes a 22½-ton truck crane. On the job photographs, as well as illustrations and descriptions of versatile and time-saving features claimed by the manufacturer are included. American Hoist & Derrick Company, 63 South Robert, St. Paul, Minn.

inflatable void forms 352

Catalogue shows re-usable inflatable rubber void forms in various applications in prestressing and in cast-in-place cored roof and floor slabs, canopies, lift slabs, bridge decks, columns and piers. Specifications and load tables are included. Elgood Concrete Forms Corporation, 378 Ten Eyck Street, Brooklyn, N. Y.

products

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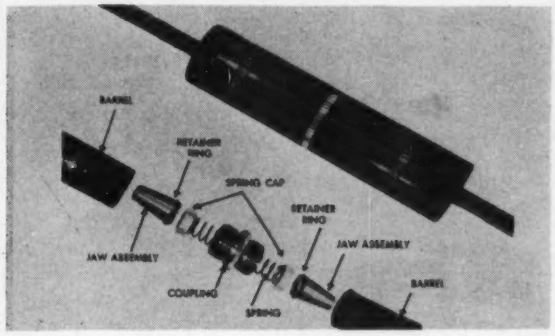

splice chuck **353**

Prestresser's splice chuck available in 6 sizes will connect ends of strands and hold them under all operating tensions. When a valuable remnant of strand remains at the dead end of the prestress bed after a prestressing operation, the strand for the new member is brought down to the remnant and connected by means of the splice chuck. Supreme Products Corp., 2222 South Calumet Avenue, Chicago, Ill.

products

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generator 354

To meet the growing demand for portable power for 180-cycle concrete vibrators and other 180-cycle tools, an engine generator incorporates an idling control that saves up to 60 percent in fuel cost, extends engine life, and lowers maintenance cost, according to the manufacturer. The unit provides 2,500 watts, 180-cycle, 3-phase, 230 volts A.C., as well as up to 1,500 watts D.C. for lights and universal motor driven power tools. Speed control is adjustable for low or high slump concrete. Wincharger Corp., Sioux City, Iowa.

forming-reinforcing product 355

A water-proofed, paper-backed wire mesh reinforcing for use in concrete floor and roof slabs is being laid in the construction of a Pittsburgh high school. Forms and reinforcing are provided in one package. Material is unrolled over steel or concrete joists, cut to length, made almost taut and clipped to joints. Placing can then begin. Material comes in 125-foot rolls, 4 feet wide, and weighs 36 pounds per square foot. Pittsburgh Steel Products Co., Grant Bldg., Box 118, Pittsburgh, Pa.

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